We claim:

1. An apparatus for applying a thin film coating to a substrate comprising:

a vacuum chamber connectable to a pump adapted to evacuate said chamber;

at least one crucible in said chamber;

a substrate holder in said chamber receiving a substrate to be coated and juxtaposed with said crucible;

a mechanical shutter in said chamber interposable between said crucible and said substrate;

a high-energy source for heating a component of a coating to be deposited upon said substrate in said crucible;

a radio frequency or pulsed direct current source connectable to said substrate holder for producing a plasma around said substrate and imparting a self-bias to said substrate holder poling said substrate holder cathodic;

means for feeding a gas mixture to said chamber including at least one gas reactive with said component to form a coating on said substrate; and

a low energy electron source for ionizing said component to reduce said self-bias and deposit a reaction product of said component and said at least one gas on said substrate, said shutter being movable from one said crucible and said substrate to permit ionization of said component.

2. The apparatus defined in claim 1 wherein said substrate holder is mounted for rotation in said chamber.

3. The apparatus defined in claim 2 wherein said chamber is formed with an insulated feed-through for connecting said source to said substrate holder.

4. The apparatus defined in claim 3, further comprising an instrument for measuring the thickness of said coating on said substrate for controlling the deposition of said reaction product on said substrate.

5. The apparatus defined in claim 4 wherein said crucible is electrically heated.

6. The apparatus defined in claim 4 wherein said component is heated in said crucible by sputtering.

7. The apparatus defined in claim 4 wherein said source is a radio frequency source.

8. The apparatus defined in claim 4 wherein said crucible is rotatable in said chamber.

9. The apparatus defined in claim 4, further comprising another crucible containing a respective component capable of forming a reaction product which can be deposited on said coating.

10. The apparatus defined in claim 4 wherein said component is heated in part by an electron beam gun.

11. The apparatus defined in claim 10, further comprising another electron beam gun in said chamber for heating said component.